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Alchornea latifolia Sw. Achiotillo
Euphorbiaceae Spurge family

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Alchornea latifolia Sw., commonly known as achiotillo in Puerto Rico as well as by many other names, is a medium-sized tree of the Greater Antilles, southern Mexico, and Central America. It is evergreen, with medium-sized leaves and light-colored, smooth bark with fine fissures (fig. 1). The species has only minor commercial value but is a significant component of moist and wet secondary forests.

HABITAT

Native Range

Achiotillo grows naturally in forests of Cuba, Jamaica, Hispaniola, Puerto Rico, and Tortola in the Caribbean *(17)*. Its natural range also extends along the east and west coasts of central Mexico through Central America and at least as far south as Barro Colorado Island, Panama *(3, 15, 21)* (fig. 2). It is reportedly planted as an ornamental in southern Florida *(17)*. Naturalization beyond its native range has not been reported.

Climate

Annual rainfall within the range of this species in Puerto Rico varies from about 1700 mm to over 3700 mm. Achiotillo also grows along streams and in cool, dry areas of Hispaniola with as little as 1500 mm annual precipitation. On the mainland, precipitation ranges from 1300 mm/yr on the Pacific coast of Mexico to 4000 mm/yr in Central America *(24)*. Rainless periods of a month or more may occur in the natural range, but the species is not adapted to extended annual dry seasons. Monthly temperatures average about 22 °C at the higher elevations in the range and fluctuate between 25 and 27 °C at lower elevations *(24)*.

Soils and Topography

Sandy loam through clay soils derived from most rock types are suitable substrate, but the soils must be moist and generally well drained *(21)*. Achiotillo commonly grows on soils that frequently have anaerobic subsoils due to high rainfall; however, it does not tolerate swampy soils. Rich, alluvial soils result in the largest stems, but some trees do grow to maturity on eroded ridges. Soils colonized by achiotillo may have pH's from about 4.5 to 7.0.

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The species grows on sites from near sea level to elevations of 1,600 m in Mexico and Central America *(3, 21)*. Achiotillo is found on steep to level topography and on all slope positions.

Associated Forest Cover

In the Sierra del Rosario, Cuba, canyons may contain evergreen high forests dominated by *Guarea guidonia* (L.) Sleumer, *Calophyllum calaba* L., *Hibiscus elatus* Sw., *Prunus occidentalis* Sw., *A. latifolia, Cedrela odorata* L., and *Bursera simaruba* (L.) Sarg. *(5)*. A primary forest in the subtropical wet life zone *(14)* containing achiotillo was dominated by *Dacryodes excelsa* Vahl, *Prestoea montana* (R. Grah.) Nichols., *Micropholis garciniaefolia* Pierre, *Ocotea*

Figure 1. — *Trunk of an achiotillo tree* (Alchornea latifolia) *growing in Puerto Rico.*

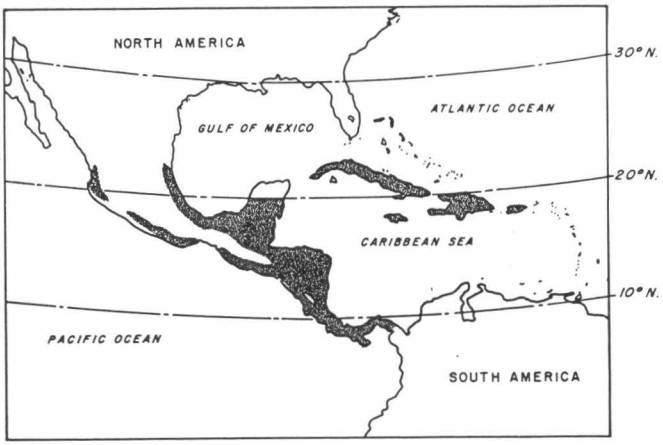

Figure 2. — *Shaded area represents the native range of achiotillo* (Alchornea latifolia) *in the neotropics.*

moschata (Meisn.) Mez, *Calycogonium squamulosum* Cogn., *Sloanea berteriana* Choisy, and *Didymopanax morototoni* (Aubl.) Decne. & Planch. *(27)*. In a subtropical moist forest over limestone in Puerto Rico, a stand containing achiotillo consisted of *Phoebe elongata* (Vahl) Nees, *Zanthoxylum martinicense* (Lam.) DC., *Spondias mombin* L., *Dendropanax arboreus* (L.) Decne. & Planch., *Inga laurina* (Sw.) Willd., *G. guidonia* (L.) Sleumer, *Cordia sulcata* DC., and *Quararibaea trubinata* (Sw.) Poir. *(6)*.

LIFE HISTORY

Reproduction and Early Growth

Flowering and Fruiting.—The small, greenish-yellow flowers grow in spikes and panicles attached at leaf axils. Male and female flowers generally are not found on the same tree *(16)*. The flowers produce a two- or three-celled capsule that is green, tinged with red. When fully ripe, the two halves of the capsule drop away exposing the seeds. The seeds have a thin, fleshy, bright-red covering that attracts seed-eating birds and bats. Fresh fruit (capsules with seeds) collected by the author in Puerto Rico averaged 0.54 g each, with a standard error of 0.12.

In the Luquillo Mountains in Puerto Rico, flowering takes place from December through May, and fruit fall occurs from February through June *(12)*. One worker *(9)* observed achiotillo fruiting throughout the year. In Cuba, flowering was observed from November to March, and fruit ripened from January to May *(25)*.

Seed Production and Dissemination.—Flowering and fruiting can be very heavy on some individual trees but is not consistent from year to year. Air-dried seeds collected from trees in Puerto Rico averaged 0.042 ± 0.001 grams per seed (author, personal observation). Although many dispersed seeds are concentrated near parent trees, large numbers of seeds appear to be spread far from their source. Birds and bats that ingest the seeds are the apparent dispersers *(9)*.

Seeds for propagation can be collected by clipping seed clusters from trees when the red color of a few exposed seeds in each cluster can be seen. Only seeds from pods that are open when collected or that open within 3 or 4 days in the shade should be used. The red, fruity layer can be removed by wet screening. If not planted immediately, the seeds should be air-dried and refrigerated in a sealed container.

Seedling Development.—Germination is epigeous. In a sample of 100 seeds, 79 percent germinated beginning 31 days after sowing (author, personal observation). A group of 43 transplants of wildlings, most about 2 months old with a mean height of 17 ± 3 cm, averaged 96 ± 5 cm in height with 93-percent survival after 13 months and 136 ± 9 cm in height with 74-percent survival after 25 months (author, personal observation).

Vegetative Reproduction.—Achiotillo has a limited ability to reproduce vegetatively. Of 25 untreated woody cuttings from saplings buried to half their depths in moist soil under shade, 2 rooted in 7 months (author, personal observation). Adventitious roots arise from wounds on trunks in wet forests; therefore, air layering is probably possible. Saplings and poles coppice when cut. Abundant epicormic branching results when crowns are damaged and light reaches the lower bole (author, personal observation).

Sapling and Pole Stage to Maturity

Growth and Yield.—Mean annual increments of diameter at breast height (d.b.h.) in undisturbed sierra palm and tabonuco forest plots were 0.42 and 0.60 cm/yr, respectively *(27)*. Diameter growth in a late secondary subtropical wet forest ranged from near zero to 1.45 cm/yr *(7)*.

Achiotillo can grow to 40 cm or more in d.b.h. on most sites if not killed by competition, storm, or cutting. The bole is often crooked, and the bark is thin, ranging from 10 to 20 mm *(1)*. The largest tree of the species known in Puerto Rico measures 70 cm in d.b.h. and 20 m in height.

Although the species is common, achiotillo consistently contributes only a small portion to the basal area of the forests where it grows. In a secondary subtropical moist forest in Puerto Rico, achiotillo contributed 0.8 percent of 24 m^2/ha of basal area *(6)*. In a secondary subtropical wet forest dominated by *Tabebuia heterophylla* (DC.) Britton, a 0.08-ha plot had a total basal area of 40.4 m^2/ha of which achiotillo made up 4.4 m^2/ha.[1] In plots of undisturbed sierra palm and tabonuco forests in the subtropical wet and subtropical rain forest life zones, achiotillo accounted for 1.3 and 1.2 percent of total basal areas of 32 and 51 m^2/ha, respectively *(27)*. The species was also present with insignificant basal areas in the undisturbed palo colorado (*Cyrilla racemiflora* L.) forests on mountain slopes *(28)*. In an inventory of potentially commercial secondary forest land in Puerto Rico, achiotillo had the 13th highest total basal area of all species encountered and 0.7 percent of the overall basal area measured *(4)*.

[1]Alemany, Salvador, [n.d.] Personal communication with the author. On file with: International Institute of Tropical Forestry, U. S. Department of Agriculture, Forest Service, Río Piedras, PR 00928-2500.

Volumes of achiotillo in high forests of Honduras are quite low, 0.2 to 0.6 m^3/ha *(3)*. Eight trees per hectare with d.b.h.'s of 30 cm or more are reported for secondary forests of Costa Rica *(1)*.

Achiotillo can be killed during timber stand improvement operations by girdling and, a few months later, cutting new bark growth that has bridged the girdle. A 36-tree test of girdling (ax frill) treated with 2,4,5-T in diesel resulted in 97-percent mortality in 6 to 12 months *(23)*.

Rooting Habit.—Seedlings produce a taproot, although it seems to be less important than the many-branched lateral roots. Hair root segments examined in Cuba were extensively infected with vehiscular arbuscular mycorrhizae *(13)*. Achiotillo produces a small buttress and well-developed lateral roots that often protrude above the soil surface on clay soils for a meter or two from the trunk.

Reaction to Competition.—The species perpetuates itself by abundant seed and seedling reproduction. After a hurricane, a clearcut, or other large-scale disturbance, achiotillo seeds stored in the forest floor produce large numbers of seedlings (fig. 3), of which only a small percentage survive longer than a few months. Furthermore, mortality caused by competition at all stages of development reduces the stand to an occasional tree or a few trees per hectare. Those few, however, are enough to reseed the area and assure achiotillo's presence after the next disturbance. It is unknown whether the seeds remain viable in the forest floor for more than one season.

Much of achiotillo's range is susceptible to periodic hurricanes. Canopy openings created by hurricanes are the principal regeneration sites in the primary forests in Puerto Rico. Areas of 4 ha each of virgin tabonuco and palo colorado forests contained, respectively, 49 and 23 achiotillo trees greater than 10 cm in d.b.h. *(26)*. Another study with a large number of plots in the palo colorado forest type found that 0.16 percent of the stems greater than 4.1 cm in d.b.h. were achiotillo *(28)*. Achiotillo also reproduces in tree-fall gaps in the primary forests. The probability of survival to maturity in small gaps is less than in areas of general disturbance. Regeneration in strip clearcuts in Puerto Rico was higher in the areas receiving near full light exposure, but the number of surviving seedlings 2 years after cutting was higher in the areas toward the edges of the openings that were slightly less exposed to full light *(8)*.

Crown position greatly influences growth of achiotillo. Dominant, codominant, intermediate, and suppressed trees in subtropical wet forests in Puerto Rico averaged 0.63, 0.53, 0.37, and 0.11 cm/yr in d.b.h. growth, respectively *(7)*. Achiotillo trees produce seeds when they are in dominant, codominant, and intermediate crown positions (author, personal observation). Trees of this species develop diffuse crowns that cast a moderate amount of shade. Plants that ordinarily grow in the understory have no difficulty in growing under achiotillo.

A crown ratio (diameter of crown to d.b.h.) of 20 to 7 reported in Cuba *(13)* matched closely the ratio of 20 to 1 observed by the author for 25 trees in Puerto Rico.

Damaging Agents.—A number of species of leaf eaters, leaf miners, sucking insects, and seed-eating larvae have been observed on achiotillo by the author. None appear to cause serious damage. The wet-wood termite, *Nasutitermes costalis* (Holmgren), has been noted on achiotillo *(19)*. This species of termites consumes dead twigs and occasionally exposed limb and trunk wood. Achiotillo wood is listed as being very susceptible to predation by the dry-wood termite, *Cryptotermes brevis* (Walker) *(29)*.

Of the achiotillo stems encountered during an extensive inventory in Puerto Rico, 25, 62, and 44 percent of the sapling, pole, and sawtimber stems, respectively, had some sort of damage or defect *(2)*. Bad form was the most important cause of degrade. Of the total volume of sawtimber, 14 percent was listed as unsound (rotten) cull.

Achiotillo wood is quickly discolored by sap- and blue-stain fungi if not sawn and dried promptly *(18)*. It also decays quickly when in contact with the ground. One hundred percent of untreated posts of achiotillo were rendered unserviceable by rot and termites during 1 year in the ground; the estimated service life for untreated fenceposts of the species is 0.9 years *(10)*.

Hurricanes cause considerable damage to achiotillo but little mortality. Hurricane Hugo of 1989 with gusts of 100 to 150 km/hr stripped away the minor branches and broke many of the major branches of achiotillo trees in eastern Puerto Rico. Few boles snapped, very few trees tipped, and the trees quickly replaced lost crown area through adventitious sprouting (author, personal observation).

Figure 3. — *Seedlings of achiotillo* (Alchornea latifolia) *about 10 weeks after removal of the forest canopy.*

SPECIAL USES

Achiotillo wood is cream to pale tan in color with reddish-brown canals throughout *(18)*. The wood has a medium texture and a low luster. Growth rings are not clearly visible. A description of the microscopic structure of the wood has been published *(1)*.

Achiotillo air-dries at a moderate rate with only moderate degrade, mostly in the form of cup, bow, and twist of the boards *(18)*. Radial shrinkage is 2.7 percent, tangential shrinkage is 8.5 percent, and volumetric shrinkage is 8.8 percent *(3)*.

The wood density of ovendried samples from a pole-sized achiotillo from a wet forest in Puerto Rico averaged 0.38 g/cm^3 (author, personal observation). The wood density for the species (air-dried) in Puerto Rico was reported as 0.46 g/cm^3 *(18)*. A wood density of 0.39 g/cm^3 (probably from an ovendried sample) was reported from Honduras *(3)*.

The wood saws and planes easily. In other machining operations, care must be taken to avoid a fuzzy surface. There is little splitting during screwing and nailing *(18)*. Achiotillo wood glues well *(3)* and takes up preservatives easily *(11)*.

Achiotillo wood is suitable for utility carpentry, boxes and crates, toys, dunnage, match splints, fuel, interior furniture parts, utility plywood, chipboard, and treated fenceposts *(3, 18)*. Actual use of the wood is limited and local at present because sizes available are generally small and because there is an abundance of utility wood from other species in this density range. Achiotillo is grown for coffee shade in Oaxaca State, Mexico *(21)*, and is used to a limited extent as urban shade *(17)*. The species is ecologically important because it helps reforest disturbed sites quickly and furnishes food for bird and bat species.

GENETICS

The genus *Alchornea* is reported to contain about 60 species of trees and shrubs with pantropical distribution *(22)*.

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